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Development of Fracture Liaison Services: What have we learned?

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Keywords: up to 10 keywords must be included.

Fracture liaison service, osteoporosis, vertebral, hip, development, bisphosphonate, frailty, injury prevention, fracture clinic, DXA.

Abstract:

Due to dramatic improvements in life expectancy we are seeing a rapidly growing population of older people. Increasing frailty and susceptibility to fragility fractures are becoming pressing issues for both the individuals that suffer them as well as society, through pressures on health and social care budgets. The success of fracture liaison services, co-ordinated programmes enhancing the management of the fracture, osteoporosis, frailty and falls risk, is undisputed. To achieve optimal outcomes, however, it is important to have a standardisation of design, scope and structure of the service. Experience has taught us that by delegating responsibility for the holistic care of the patient to a trained and adequately resourced professional/team (fracture prevention practitioner) with clear standards against which benchmarking occurs, is the optimal model of delivery. Future challenges include how best to measure the success of services in imparting a reduction in fractures at a local population level as well as how to detect those patients with unmet need who do not uniformly present to health care services, such as those with vertebral fractures. The implementation of fracture liaison services however, is a clear demonstration of how collaboration between health care, social care and charity organisations, among others, has materially improved the health and well-being of the population.

Introduction

Medical and societal changes mean that people are living longer. With increasing age, however, come the risks of frailty that can express themselves in many ways, including an increased tendency to fall and fracture. Even with relatively minor trauma, fractures may ensue, fragility fractures that can have catastrophic consequences to the individual through attendant mortality and morbidity. Furthermore, in addition to the personal costs of such fractures, the societal and economic impact of fragility fractures is increasingly evident in the growing older frail cohort. Loss of independence and reliance on the state for care and support as well as the direct health care costs of fragility fractures has spurred global interest to innovate and effectively prevent fragility fractures through introducing models of clinical service that identify those at risk and then effectively intervene to prevent subsequent fractures – fracture liaison services (FLS).

Fragility fractures are defined as fractures occurring as a result of a fall from standing height or less. They primarily affect older people in whom osteoporosis and increased risk of falls are contributory factors[1]. Morbidity and mortality is significant; in England 1 in 4 people die within a year of suffering a hip fracture, with a doubling in the standardised mortality ratio in the first year[2,3]. In those who survive, there are far reaching, long-term consequences and complications such as loss of confidence and independence, which can also have a negative impact upon those providing a caring role.

Fracture prevention programmes have evolved over the last two decades and have taken many shapes, mostly targeting those presenting with their first fracture. Early strategies attempted to identify patients and convey patient-focused (or sometimes GP-focused) written material regarding fracture prevention; such strategies did not result in large scale treatment uptake with no clear evidence of significant change in incidence of fractures. However, more sophisticated and highly effective fracture prevention programmes, such as FLS, assess patients through clinical interactions

that instigate all necessary investigations, referrals and treatment with longer term follow up to ensure adherence. Adopting these more sophisticated fracture prevention models (through FLS, see figure 1) can reduce hip fracture and refracture rates by more than a third[4,5]. This review focuses on some of the lessons learnt when developing FLS to prevent fragility fractures.

When to intervene: primary versus secondary prevention

Increasing bone fragility and frailty plus the accumulation of other factors including co-morbidities, polypharmacy and sarcopenia predispose towards injury in the form of fragility fractures[6,7,8,9]. Though primary prevention is appealing, and there is growing interest in screening for osteoporosis[10], the focus of this review is on secondary fracture prevention that identifies at risk individuals on the basis of them having sustained a new incident fragility fracture – as such, many services are co-located within fracture clinics, working alongside trauma teams as part of an integrated acute care and prevention team.

Almost half of patients presenting with a hip fracture have had a previous non-hip fragility fracture[11], suggesting that that there is an opportunity to intervene with effective osteoporosis treatment in order to reduce the likelihood of an ensuing hip fracture. Those with an incident fragility fracture thus represent a high risk population where interventions such as bone active medical treatments (such as bisphosphonates) and falls interventions are justified[12]. Patients who are provided with appropriate contextualised advice and information at the time of the fracture are likely to be more amenable to commencing therapy to mitigate further fractures. Also, the 'inconvenience' of being immobilised during the treatment of the incident fracture may mean that patients are more likely to be receptive to interventions to reduce the likelihood of future events.

There are robust data for bisphosphate prescribing in the setting of secondary fracture prevention with increasing cost effectiveness with increasing age and prior fracture[13]. This approach to secondary fracture prevention is supported by NICE, also recommending a multi-disciplinary hip fracture programme, e.g. a FLS (see figure 1), due to their well-established success[14,15]. At the core of a FLS is a fracture prevention practitioner (FPP) who co-ordinates secondary fracture prevention interventions for an individual with the intention to standardise high quality care and facilitate communication between the patient and health care and social care providers.

How to intervene: the optimum model?

What is the optimal service model to reduce fragility fractures? Fracture prevention programs have varied in design and structure but one trend has appeared, namely that a clinician (FPP) must have key responsibility for managing both fractures and falls risk in order to be maximally effective. Suggestive evidence for this is that simple dissemination of written education leaflets directed to the physician and/or patient (without a direct clinical interaction) has demonstrated no significant effects on refracture rates nor an increase in appropriate bone density scan (DXA) referrals[16]. A service that is limited to letters to primary care physicians to request prescribing results in low rates of bisphosphonate prescription[17]. With more sophisticated clinical interactions via FPPs, appropriate DXA referrals and bisphosphonate prescribing is increased in addition to more effective completion of a comprehensive falls risk and fracture assessment[18].

Although the majority of FLS are run within a secondary care environment, some community-based programmes operate, although attendance for subsequent DXA scanning appointments in these models may be as low as 45%[19]. By delegating responsibility for components of the FLS to non-specialised staff (for example GPs) without specific and designated resources, delay and variation in practice is introduced and efficacy may be compromised, as evidenced by failure of education only

programmes[14]. A meta-analysis examining the collaboration of orthopaedic teams with an orthogeriatrician has proven reduction in mortality demonstrating the benefit of expanding care beyond purely fracture fixation[20]. FPPs who are not medically trained, e.g. nurses, have been a successful alternative to physicians as primary healthcare professionals[21]. Adequate resources, education and training however must be in place with standard competencies ranging from beginner to expert[22]. Completion of accredited FPP training not only supports and informs the individual but is auditable according to clinical standards and should result, if put into practice, in improved clinical outcomes[22,23]. In order to work effectively there should be access to investigations and specialist advice and, most importantly, orthopaedic engagement, with FLS embedded within fracture clinic/services.

It is important to establish 'what good looks like' in terms of delivering an effective FLS model of care. UK national clinical standards for FLS have been published by the National Osteoporosis Society (NOS) that provide ten clear, practical and deliverable parameters that define a high quality FLS. The 5IQ model has been widely adopted describing standards for **i**dentification and **i**nvestigation of the patients followed by providing **i**nformation to the patient and appropriate **i**nterventions (bone protection and falls prevention) (figure 2)[23]. Finally, **i**ntegration of care by sharing information with patient and primary care and follow up of the patient once discharged to the community to ensure interventions are initiated and adhered to by the GP and patient alike is mandated. This is essential to realise the fracture prevention benefits of the treatment. The **Q** represents quality, and quality assurance as well as on-going training of staff, is recommended as part of the service model. We have shown that it is feasible and practical to deliver the indicators within the 5IQ model (figure 2)[24].

As the evidence base behind bone fragility, fracture susceptibility and osteoporosis has developed, there has been a more sophisticated approach to fracture prevention within FLS compared with early BMD only-based models. FLSs should provide a holistic management of the patient to include

an assessment of falls risk as well as bone health. The scope of FLS should also include referrals/signposting to other services including optometry, podiatry, alcohol and smoking cessation, social care, rapid response and home safety services, physiotherapy, occupational therapy and third sector organisations (charity and self-help groups) and for Holter monitors. By using and then studying social prescribing, patient and carer voices can be integrated, promoting collaboration with rehabilitation and care services. The untapped expertise of other organisations, already providing services that would benefit those suffering from falls and fractures can be incorporated. If social prescribing is readily available and used, it can modify services driven by real data e.g. large numbers referred to an exercise class or for home safety assessment. If capacity is exceeded resources can therefore be redirected to fulfil the unmet need.

Loss to follow up to allied services, such as mentioned above, is reduced by direct referral from the FLS; this also enhances efficiency of the service by reducing the number of steps required. A detailed assessment by an individual trained to provide holistic bone health and falls review can produce a management plan individualised to the patient, balancing medical and social needs with patient preference. Therefore a FLS offering holistic care beyond just medications in a prompt fashion has considerable benefits and better patient adherence as well as being well received by orthopaedic teams. This has been shown to reduce the likelihood of further injury at a stage of vulnerability and high risk of further injuries[14]. This model may also reduce hospital admissions however further investigation of patient outcomes need to take place to fully quantify this. The FLS should also promote independence and reduce expenditure in social care through prevention, particularly of hip fractures. The NOS estimates that around half of the estimated financial benefit of prevented fractures is realised in social care budgets[25]. Ref NOS Benefits Calculator online.

Comment [s1]: reference

Fracture liaison service interventions – making them happen and demonstrating it

Translating a service model from a theoretical framework to an operational service to benefit patients is essential. Those responsible for funding FLS demand demonstration of effectiveness and compliance with clinically relevant key performance indicators. Clinically assured quality standards that are monitored provide a means for this quality assurance. In addition to the NOS 5IQ standards mentioned above, standards have been written by many other organisations[23,26,27,28,29]. Recording workload and performing benchmarking informs commissioning; drives service development; illuminates discrepancies in care, e.g. only 37% of services had a FLS in the UK in 2010 (see Table 1 for examples of service improvement); and highlights those services performing well whose best practice can be shared[30]. Various organisations have set up databases and audits to benchmark and drive improvements. A good example is the Royal College of Physicians Falls and Fragility Fracture Audit Programme, which audits and publishes hip fracture care against a national quality standard (QS16)[31,32].

Benchmarking and cost effectiveness analyses have provided the impetus to influence the commissioning agenda. For example, the NHS Right-Care programme, developed to reduce 'unwarranted variation', has examined the impact of suboptimal and ideal care, demonstrating a 91% reduction in health care costs in one case in addition to the improved outcome by an holistic approach to fracture management[33]. By incorporating the FLS clinical standards into the National Hip Fracture Database (NHFD) this should help orthopaedic services embrace these standards as publication of performance dashboards drives improvements in the system[34]. Interestingly, through national audit programmes, non-evidence based and partial services have been identified. The reasons for this degree are complex with shared responsibility shared across commissioner provider functions. Certainly there are examples of poorly-informed commissioning decisions but poor delivery (which can be shown by auditing against published standards) can lead to waste and potential dilution of the benefits of a well commissioned FLS[35]. The FLS Implementation Toolkit was

developed by the NOS to aid departments with drafting service specifications and business cases conforming to best practice guidelines and current evidence base[36].

It is clear, from any change model, that stakeholder engagement is key to achieving successful and widespread uptake of (FLS) programmes. The improvements wrought in fracture care and prevention are at least in part due to coordination between a range of agencies such as government agencies, health care organisations and in fact this has been led by charities to ensure collaborative working to improve care. Good examples within the UK are the Royal College of Physicians with the NHFD and FLS database and the NOS with its FLS implementation group and clinical champions[31,37].

Future of Fragility fracture intervention: challenges and successes

FLS have been successful; they do reduce recurrent fractures, but data vary depending on the design of the FLS[14,38]. An FLS, in addition, can facilitate a seamless journey for the patient between surgical and medical care whilst admitted and continue, or instigate, treatment for those within the community. Moving services out of acute hospitals has been on the NHS agenda for years and a well-designed FLS can promote this agenda through robust communication of plans to community partners and remote follow up such as telephone consultations.

The financial case for FLS is premised on reducing fragility fractures in a population. The evidence for effectiveness in treated versus untreated cohorts is strong but demonstrating it in a registered or resident population presents a challenge[38,39]. The NHS Right Care metric is the incidence of hip fractures in patients ≥60 years. These represent only around 20% of total fragility fractures and there is substantial variation from year to year even in populations of several million[40,41]. Detecting the important but modest percentage reduction from an effective FLS and showing this with statistical significance within the required time horizon of 1-3 years is not possible. As an alternative, the NOS has looked at the number of patients on bone sparing medication per 1000 population over 50 years

of age as a useful proxy measure. This metric can show statistically significant change within a few months of introducing a *de novo*, or further developed, FLS.

Another challenge faced is the identification of vertebral fractures, commonly missed on x-ray, usually diagnostic of osteoporosis, and with a low rate of presentation to health care services, particularly if occurring in isolation[42,43]. Additional views in dual energy X-ray absorptiometry (DXA, bone density scans) protocols such as use of vertebral fracture assessment (VFA), could help detection if primary prevention models are widely instigated[44,45]. Other techniques exist such as CT scan, MRI and algorithm-based reporting for example but the optimal method is still debated[46]. Research is underway examining how best to reduce the 'treatment gap' by identifying those at highest risk of fracture who will benefit most from intervention not currently being treated e.g. vertebral fractures and primary prevention[47].

The ability to do more good by addressing the primary prevention population is clear but the most clinical and cost effective method is still debated. Incorporating assessment of sarcopenia as well as BMD (e.g. FRAX®) and falls assessment may be the optimal model but further research is required[48]. If the UK GP contract identifies the measurement of frailty in over 65s as a priority, this could improve care and reduce injuries as well as providing vital data to support service development and commissioning[49]. With Sustainability and Transformation Plans (STPs) active in UK planning of health and social care, FLS are optimally placed to identify those patients who have complex needs and co-morbidities to intervene to reduce injuries, fractures and attendant disabilities. There are clear whole system benefits available from identifying this cohort of patients as they have an associated high health resource requirement.

To conclude, implementation of FLS across the UK and globally is increasing although by no means is there universal coverage. There is growing awareness that FLS is becoming a 'standard of care' and

not an optional extra. To ensure maximum benefit to patients and payers alike, it is important that the model of FLS delivery addresses appropriate clinical quality standards and metrics. There is more work to do in terms of identification of vertebral fractures. Probably the most powerful lesson learned from developing FLS is the value of effective partnership working between charitable organisations, healthcare professionals and government bodies. This collaborative working has allowed rapid development and implementation of FLS, addressing the varying agendas and needs of patients, health care providers, commissioners and health and social care planners.

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Ethics: not required.

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Figure 1: Diagram to represent role of fracture liaison service in secondary fracture prevention. A person, or team, known as a fracture prevention practitioner co-ordinates holistic assessment and management of fragility fractures within a healthcare setting but collaborating with patient and other essential organisations.

Or Figure 1: National Osteoporosis Society's example of generic fracture liaison service.

Figure 2: Diagrammatic representation of National Osteoporosis Society fragility fracture management 5IQ standards for a fracture liaison service.

Table 1: Service improvements for FLS over the last 2 years (2015-2017); NOS in house data.

Figure 1

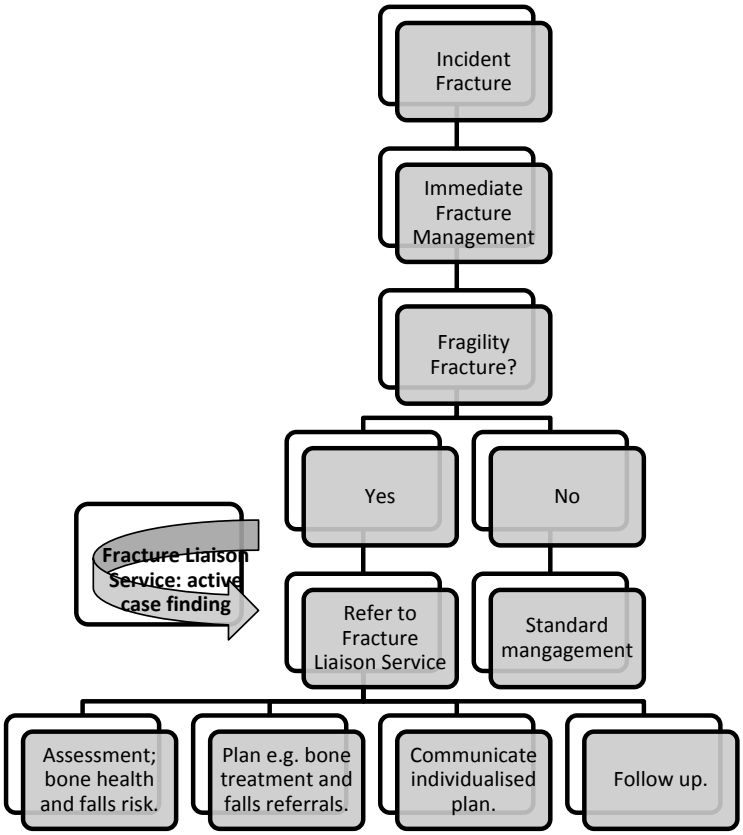
Incident Fracture
Immediate Fracture Management
Fragility Fracture?
Yes
No
Fracture Liaison Service: active case finding
Refer to Fracture Liaison Service
Standard mangagement
Assessment; bone health and falls risk.
Plan e.g. bone treatment and falls referrals.
Communicate individualised plan.
Follow up.

Figure 1

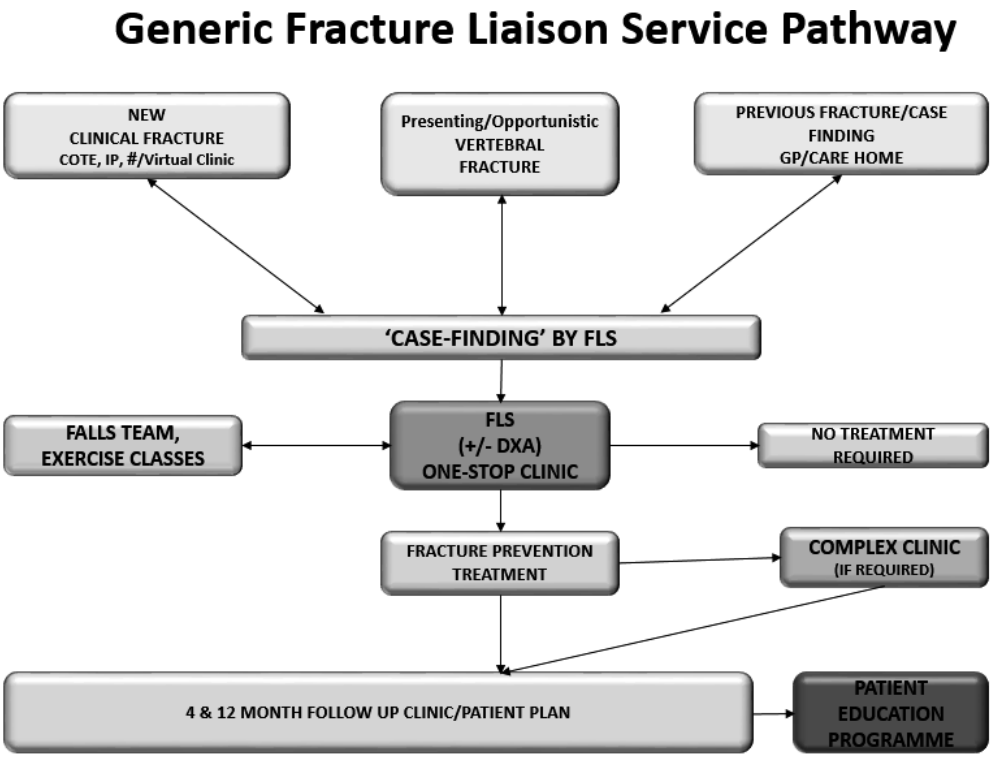
Generic Fracture Liaison Service Pathway
NEW
CLINICAL FRACTURE
COTE, IP, #/Virtual Clinic
Presenting/Opportunistic
VERTEBRAL
FRACTURE
PREVIOUS FRACTURE/CASE
FINDING
GP/CARE HOME
'CASE-FINDING' BY FLS
FALLS TEAM,
EXERCISE CLASSES
FLS
(+/- DXA)
ONE-STOP CLINIC
NO TREATMENT
REQUIRED
FRACTURE PREVENTION
TREATMENT
COMPLEX CLINIC
(IF REQUIRED)
4 & 12 MONTH FOLLOW UP CLINIC/PATIENT PLAN
PATIENT
EDUCATION
PROGRAMME

Figure 2

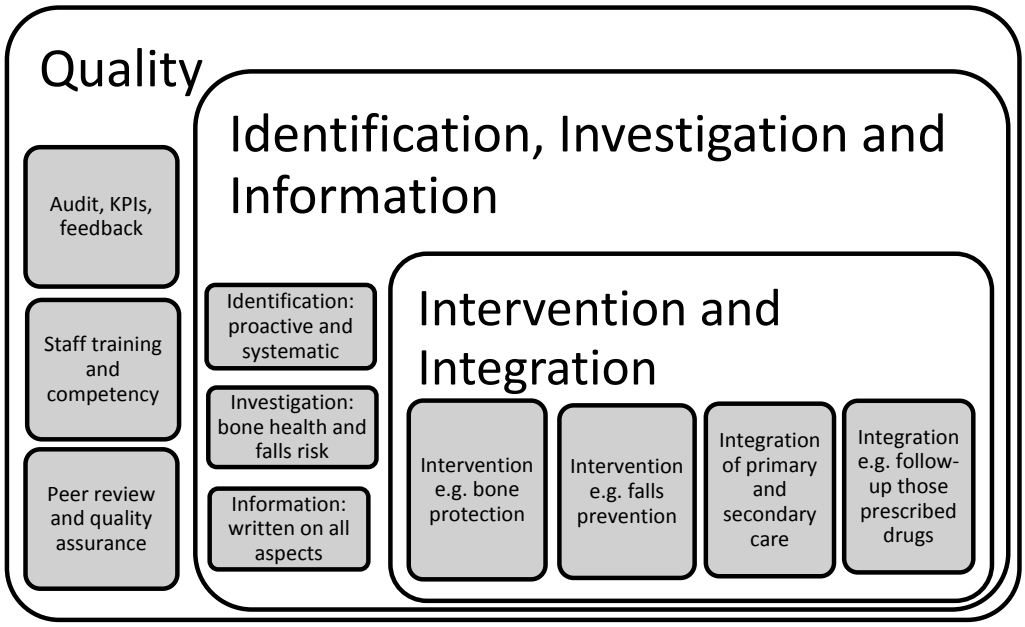
Quality
Audit, KPIs, feedback
Staff training and competency
Peer review and quality assurance
Identification, Investigation and Information
Identification: proactive and systematic
Investigation: bone health and falls risk
Information: written on all aspects
Intervention and Integration
Intervention e.g. bone protection
Intervention e.g. falls prevention
Integration of primary and secondary care
Integration e.g. follow-up those prescribed drugs

Table 1

Intervention Type					
	England	**Northern Ireland & Isle of Man**	**Scotland**	**Wales**	**UK**
New service development	59	1	2	7	69
Quality improvement; commissioning	33	5	1	1	40
Quality improvement; peer support	23	1	12	6	42
Early engagement	22	0	1	2	25
Sub-total	**137**	**7**	**16**	**16**	**176**
Commissioning					
New services	13	0	1	3	17
Existing service enhanced	6	0	0	0	6
Sub-total	**19**	**0**	**1**	**3**	**23**
Benefits					
Total population covered	4,201,867		300,410	962,188	5,464,465
Hip fractures prevented*	1,482		102	348	1,932
Gross benefit of all fractures prevented (£)*	29,841,500		1,995,006	6,772,362	38,608,868

*Over 5 years. Figures based on 17 new services NOS has helped commission.